

Comparative Study between Laparoscopic Varicocelectomy and Subinguinal Varicocelectomy in Treatment of Primary Infertility

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Abstract

Varicocele defined as dilated and tortuous veins of the pampiniform plexus which is the net of veins that drains blood from both testicles within the spermatic cord. varicoceles are a common identified scrotal disease. Their prevalence in the normal adult male population is 15-20% & they are thought the commonest treatable cause of male infertility. The laparoscopic and subinguinal varicocele surgery has been proven to get better outcomes in many studies. To compare two methods for varicocelectomy Laparoscopy & subinguinal in treatment of primary infertility. Patient and method: Prospective randomized study was performed about laparoscopic varicocelectomy (A) and subinguinal varicocelectomy (B) in primary infertility, from April 2018 to June 2020. Fifty patients in two groups with clinically palpable varicocele confirmed by U/S Doppler complaining of primary infertility as a main symptom with reflux of pampiniform plexus of any grade, unilateral or bilateral. All cases undergone varicocelectomy bilateral a follow up done within one year for postoperative complications, semen parameters and pregnancy rate. Results: There was significant difference between operative time in both groups (the mean operative time was 36.28 ± 8.21 vs 49.72 ± 7.89 for laparoscopic and subinguinal respectively). Laparoscopic varicocelectomy had much less pain with highly significant difference in comparison with subinguinal ligation. There was significant difference between outcomes of semen parameters at six months postoperative in both groups regarding count, motility, vitality and abnormal shapes ($p \leq 0.001$). Pregnancy rate improved in both groups (40% vs 32% for laparoscopy and subinguinal respectively). Convalescence days (4 days in group A & 5 days in group B) But no significant difference regarding the hospital stay (one day), and postoperative complications. Conclusion: Varicocele is a highly prevalent condition in the infertile male population. The best method in varicocele treatment is yet a contentious issue. Both methods has short hospital stay, rapid recovery and sooner return to work but laparoscopic has less postoperative pain, shorter operative time and easy accessibility for bilateral varicocelectomy with better outcomes.

Keywords: laparoscopic varicocelectomy, subinguinal varicocelectomy, primary infertility.

1. Introduction

Varicocele is as an abnormal tortuous dilated veins of pampiniform plexus which is the net of veins that drains blood from the testicles through the cord within the inguinal canal. Varicocele graded for 3 grades: I - Valsalva positive (by palpated with Valsalva manoeuvre); II - palpable (can be palpated without the Valsalva manoeuvre); III - visible (can be seen). Varicocele is a reversible problem of male infertility [1].

About 15% of the male population in general is affected by varicocele, and affect up to 35% & 75% of male infertility for primary and secondary types respectively. It was reported that only 15%- 20% of males affected by varicocele are infertile [2].

There was many reports how varicocele affect male infertility and how it have been proposed , the commonest is sperm damage from high temperature in the scrotum, trapping of the waste products in slowly flowing venous blood in the testicular veins. In addition to abnormalities in the semen analysis, varicocele has been associated with abnormal sperm DNA quality, testicular hypotrophy, impaired testosterone production (negative impact of varicoceles on testicular hormonal secreting cells function) [3].

Indications for management of varicocele include: infertility, pain, scrotal swelling, psychic or cosmetic problems and affection in childhood or adolescents for fear of possible testicular damage in the future and if one or more abnormal semen parameters. Also advisable for mens with varicoceles and disturbed semen parameters who are not well trying to get pregnancy or in asymptomatic patient with failure of medical check up [4].

Surgical treatment for varicocele include the traditional inguinal or high retroperitoneal, laparoscopic repair and microsurgical lymphatic sparing surgery via an inguinal or subinguinal techniques. Varicocele percutaneous embolization through jugular or femoral vein is take a longer time with failure rates up to 15% and considered less invasive, all aim to stop of the reflux in the testicular vein. All these procedures of varicocele repair can be complicated by hydrocele formation, recurrence of the varicocele, possibility of persistence of varicocele and rarely atrophy of testis [5].

Laparoscopic varicocelectomy is a new technique that save time, effective in bilateral varicocelectomy, safe and effective surgical procedure which could be replace open methods. The better identification of the anatomy and

structures, as a minimally invasive surgery can decrease postoperative morbidity and the rapid recovery and return to work of the patients have made this technique as superior to routine open approaches [6].

2. Aim of the work

This study aims to compare two surgical methods laparoscopic and subinguinal ligation of primary varicocele in treatment of primary infertility looking at the outcome of each procedure in terms of morbidity, effect on semen parameters, operative time, pain score, hospital stay, return to work and complications also to figure out which of both techniques is optimum for the treatment of primary infertility.

3. Patient and method

The study was conducted within 2 years at the Department of Surgery, Benha University from April 2018 to June 2020. All patients had primary infertility as a main complaint with abnormal semen parameters. The varicocele diagnosis was done by physical examination with the Valsalva maneuver and Doppler ultrasonography.

Varicocele grades (grade I to III): Grade I – Small varicosities (palpable at Valsalva manoeuvre only); Grade II – palpable, Grade III - visible (seen at distance). The simplified colour Doppler ultrasound classification of varicocele as follow Grade I – Small dilated veins with reflux seen only during the Valsalva manoeuvre. Grade II – Enlarged vessels whose calibre increases during the Valsalva manoeuvre. Grade III- Obvious vessels that enlarge and increase in size with reflux that is present under basal conditions and does not increase during Valsalva manoeuvre.

The present study included 50 patients classified for 2 groups: group A include 25 patients (laparoscopic varicocelectomy) and group B (subinguinal varicocelectomy), age from 19 to 44 years old and presented with unilateral or bilateral varicoceles. Semen analysis done before the operation after 3-5 days of abstinence. With a special emphasis on count, motility and percentage of the abnormal forms.

Preoperative preparations

Complete history taking, physical, routine preoperative investigations and Doppler examination to detect reflux and grade of varicocele. All patients of both groups were given parental antibiotics i.v. before the operation.

Group A (laparoscopic group)

General anesthesia was performed in all patients with endo-tracheal intubation. They were placed in the Trendelenburg position (to displace the

bowel cephalad). Trans-peritoneal approach was carried out, 1st induction of pneumo-peritoneum by insufflation of carbon dioxide through a Veress needle which introduced through a sub-umbilical mini-incision. As the pressure intra-abdominally reached 14mmHg, a safety 10-mm trocar sheath unit could introduced through the same incision. Pressure was then established at 14mmHg. Through that port the camera was inserted and the abdominal cavity and viscera were inspected in a systematic order. Two working ports were further introduced at a level just caudal to the umbilicus and lateral to the rectus muscle of both right and left lower quadrants under direct laparoscopic vision (to avoid injury to the inferior epigastric vessels), the rt port could be 10mm while the left port could be 5mm caliber.

It was mandatory to identify and explore the Doom triangle before any dissection begins. The posterior pelvic anatomy is carefully identified, including the vasdeferens, gonadal vessels and iliac vessels. The posterior peritoneum overlying the spermatic vessels is tilted up by using laparoscopic forceps and incised with scissors or electrocautery just cephalad to the internal ring. Gentle traction of the ipsilateral hemiscrotum allowed easy identification of veins. The vascular pedicle was grasped and it was dissected approximately 3cm- 5cm from the parietal peritoneum. The testicular vein was dissected from the artery and lymphatic then clipped approximately 3 to 5 cms from the deep ring of inguinal canal (isolated ligation clipping and division of the testicular vein).

After ensuring hemostasis, the peritoneotomy was left open without closure and the same procedure was repeated on the contralateral side. After we finished varicocele ligation, hemostasis of the abdominal wall was accomplished before trocar get out and close of the trocar site by absorbable sutures.

Group B (Subinguinal ligation)

All cases were performed under spinal anesthesia. In the supine position, The external ring of inguinal canal was identified by palpation along the cord spermatic and then a 2–3-cm transverse incision is made over the cord at the level of two finger-widths below the external inguinal ring. The Camper's and Scarpa's fascia were divided using electrocautulation, the incision was deepened and the spermatic cord was seen and holded with a Alis or Babcock and dissected bluntly then elevated with the index finger.

The cord covering were opened, the external layer of spermatic fascia was teased from the spermatic cord, the internal spermatic fascia and cremasteric were opened, the dilated veins of pampiniform plexus dissected and doubly

ligated with 2-0 vicryl suture, mostly we could ligate veins in laparoscopic cases ranged from one to three whereas in the subinguinal case the range extended from two to seven. Careful and delicate dissection could be taken to save the lymphatics and arteries by delicate dissection and ligation of dilated veins. Closure in layers were done of superficial fascia and skin. All patients undergone bilateral varicocelectomy in both groups and the operative time was calculated not including the time for anesthesia.

Postoperative work up

All the patients of both groups were observed for vital signs and for postoperative pain and early postoperative complications. Oral liquid diet allowed within 2 hrs for group B and

within 6 hours after the operation for group A. All the patients went home within 24 hours and returned back after one week to remove the stitches. Semin analysis was done at 6 months with special emphasis on count, motility, vitality and abnormal forms. Follow up over one year postoperative to detect the recurrence, hydrocele and pregnancy rate.

4. Results

The present study of total 50 patients, average age from 19 to 44 yrs with unilateral or bilateral varicocele and all cases operated bilaterally with mean operative time significantly shorter in group A 36.28±8.21 while in group B 49.72±7.89.

Table (1) Operative time in both groups.

Operation time	Group A (N=25)	Group B (N=25)	t-test	p-value
Mean±SD	36.28±8.21	49.72±7.89		
Range	25-A60	35-A64	34.803	<0.001**

This table shows highly statistically significant difference in group A in comparison to group B.

Postoperative pain

Is measured in the 1st 24 hrs postoperative by numerical pain scale as follow: Mild pain: scale 1,2 and 3, Moderate pain: scale 4,5 and 6, Severe pain: 7,8, 9 and

10. Mild and moderate pain was treated by non steroidal (one and two injections respectively) while severe pain was treated with narcotic injection.

Table (2) Postoperative pain.

Postoperative pain	Group A (N=25)	Group B (N=25)	x ²	p-value
Mild pain	19 (76%)	6 (24%)		
Moderate pain	5 (20%)	14 (56%)	13.690	<0.001**
Severe pain	1 (4%)	5 (20%)		

This table shows highly statistically significant difference in group A in comparison to group B.

Hospital stay

All patient of both group were ambulated in the same day of operation. All patients

discharged within 24hrs except one patient in group B had wound haematoma and discharged after 2days.

Table (3) Hospital Stay.

Hospital stay (day)	Group A (N=25)	Group B (N=25)	t-test	p-value
Mean±SD	1.00±0.00	1.04±0.20		
Range	1-A1	1-A2	1.000	0.322

This table shows no statistically significant difference between group A and group B according to hospital stay (day).

Complications

In group A, incidence of recurrence, scrotal swelling in the form of pneumoscrotum and recurrence were reported as (4% and 4%

respectively), more over we reported wound infection 4%, wound haematoma 4% and one patient with spinal headache in 4% group B.

Table (4) Complications.

Complications	Group A (N=25)	Group B (N=25)	X ²	p-value
No detected complications	23 (92%)	21 (84%)		
Scrotal swelling	In the form of Pneumosrotum (4%)	0 (0%)		
Wound infection	0 (0%)	1 (4%)		
Wound hematoma	0 (0%)	1 (4%)	6.091	0.413
Hydrocele	0 (0%)	1 (4%)		
Recurrence	1 (4%)	0 (0%)		
Anaesthesia complications	0 (0%)	1 (4%) In the form of spinal headache		

This table shows no statistically significant in group A in comparison to group B according to complications.

Convalescence rate

in group A all patients returned to their daily normal activities within 4 days (the mean convalescence rate is 3.96±1.06) in

comparison to group B they returned within 5 days (the mean convalescence rate is 4.40±1.96).

Table (5) Convalescence Rate.

Convalescence rate	Group A (N=25)	Group B (N=25)	t-test	p-value
Mean±SD	3.96±1.06	4.40±1.96	0.976	0.328
Range	2-A6	2-A10		

This table shows no statistically significant difference between group A and group B according to convalescence rate.

Pregnancy rate

percentage of pregnancy rate reported in group A and B with better improvement in group A (40% and 32% respectively).

Table (6) Conception Rate .

Conception rate	Group A (N=25)	Group B (N=25)	χ ²	p-value
Negative	15 (60%)	17 (68%)	0.347	0.556
Positive	10 (40%)	8 (32%)		

This table shows no statistically significant difference in group A in comparison group B according to conception rate.

Semen parameters

In our study we reported highly significant improvement in all semen parameters postoperative in both groups (group A & group B) regarding count 25.16±10.92 preoperative vs 40.64±13.19 postoperative in group A and 27.22±12.26.

preop vs 38.12±12.19 postop in group B while motility 32.52±9.42 preop vs 47.52±8.94 postop in group A and 33.36±8.22 preop vs 45.72±8.47 postop in group B. Vitality 35.38±10.70 preop vs 52.40±10.42 postop in group A and 44.44±14.51 preop vs 53.28±10.77 postop in group B. Abnormal shapes 63.64±13.58 preop vs 43.04±9.88 postop in group A and 59.76±15.69 preop vs 41.76±10.19 postop in group B.

4. Discussion

Our main goal of varicocelectomy is to improve the testicular function and increase the pregnancy rate for infertile men with primary infertility. The recent meta-analysis and literature reviews reported that the laparoscopic and subinguinal varicocelectomies outcomes are comparable [3].

Nowadays, the laparoscopic approach to varicocele ligation has superior in treatment of bilateral varicoceles as better visualization of the laparoscope make the identification of the spermatic veins and artery much better, potentially reducing the incidence of recurrence of the varicocele and of damage of

arterial supply to the testis also better magnification also allows better preserve lymphatics thus decrease the risk of recurrence [4].

At our department two methods of surgical ligation of bilateral varicocele were performed to compare the difference between laparoscopic and subinguinal varicocele and efficacy in treatment of primary infertility regarding semen parameters and related rate of conception, operative time, hospitalization days, postoperative pain and postoperative complications.

We reported that the postoperative pain is highly significant different, it was much less in laparoscopic group than the open subinguinal group (severe pain 1 (4%) and 5 (20%) respectively). Haluk et al., [7] because all (100%) the patients in the open subinguinal surgery group had severe pain and needed one or more narcotic analgesics but it was only 13% for the laparoscopy group.

We found that the operative time significantly longer in open subinguinal than laparoscopic surgery (statistically highly significant), in patients with bilateral laparoscopic procedure was 36.28 ± 8.21 minutes and 49.72 ± 7.89 minutes for bilateral open subinguinal method, A similar results by a study done by

R.Hasan et al., [8] operative time for the open subinguinal ligation longer than the laparoscopy, with a mean operative time of 38.75 ± 7.8 and 30.48 ± 10.6 minutes (for subinguinal and laparoscopy respectively). In contrast with

A.Shamsa et al., [9] reported the mean operative times 30 ± 5.5 minutes and 27 ± 3.5 (laparoscopic and subinguinal respectively).

Regarding hospital stay we found that there was no statistical difference between the two groups as all patients discharged within 24hs postoperative except for one patient in group B discharged within 48 hs.

M.Watanabe et al., [10] hospital stay of both groups of laparoscopic and open subinguinal all patients were discharged 1 day after the surgery.

C.E.Iselin et al., [11] reported the mean length of hospital stay (0.9 days) and median total recovery time (5 days) were remarkably short in laparoscopic group. The length of hospital stay was not affected by whether the patient had unilateral or bilateral varicocele.

We reported return to normal activity within 4 days and 5 days for laparoscopic and subinguinal respectively.

M.C.McManus et al., [12] reported return to normal activity within 2-3 days for laparoscopic varicocele.

G.A.Bebars et al., [13] found the mean time to return to normal activity as 4.5 days in the laparoscopy group and 8.9 days in the open surgery group.

We reported hydrocele in one patient 4% in laparoscopic group and none for subinguinal group, in similar with

S.Islam et al., [14] studied 56 patient and reported 0% for subinguinal and 13% for laparoscopy. Different with

V.Choudhary et al., [6] studied 50 patients and reported one patient hydrocele 4% for open subinguinal and one patient 4% for laparoscopy.

Our study reported 1 patient (4%) scrotal swelling in the form of pneumoscrotum in group A varicocele and none (0%) in group B.

A.Shamsa et al., [9] reported 2 patients (6%) in laparoscopic group had scrotal emphysema was observed and disappeared within few days and none (0%) in subinguinal group.

S.Islam et al., [14] reported similar results in 56 varicolectomies didn't report scrotal swelling postoperative in the form of haematoma or pneumoscrotum in laparoscopic or subinguinal approaches.

The recurrence rate in our study on 50 patients we reported 1 patient (4%) for laparoscopic and none (0%) for subinguinal varicocele, which is concurrent with

R.Hasan et al., [8] reported recurrence in 2 (6.7%) patients of laparoscopic group but it was not observed in patients who underwent open varicocele. Different to the incidences of recurrent varicocele with

V.Choudhary et al., [6], studied 50 patients and reported (2 patients 8% vs 1 patient 4% for open and laparoscopic respectively).

In our study we reported only one patient 4% wound infection and one patient 4% wound haematoma for subinguinal group and no detected wound infection or wound haematoma in laparoscopic group, this is agree with

V.Choudhary et al., [6] who had similar results and reported one wound infection 4% and 2 wound haematoma 8% in subinguinal group and no wound infection 0% and one wound haematoma in laparoscopic group. Our result in contrast with

V.Haluk et al., [7], reported no wound infection 0% or haematoma 0% in subinguinal while in laparoscopy group he reported 1 patient wound haematoma (5%) and wound infection 1 patient (5%).

In our study we reported highly significant improvement in all semen parameters

postoperative groups at 6 months in both (group A& group B), Watanabe et al., [9], reported improvement in semen parameters, after 6 months: sperm count was significantly improved in both groups with slight changes in sperm motility (laparoscopic group: sperm count 21.9 ± 22.2 preoperative, and 39.1 ± 32.1 postoperative while in subinguinal group 23.5 ± 29.7 preoperative and 40.1 ± 40.2 postoperative after 3 months while motility 40.4 ± 18.8 preoperative and 42.1 ± 19.4 postoperative in laparoscopic while 32.4 ± 26.0 preoperative and 37.8 ± 25.7 postoperative in subinguinal.

R.Hasan et al., [8] reported no significant change in semen parameters postoperative regarding the count, motility and morphology in both groups.

A.Farag et al., [4] Preoperative semen quality was compared with that after laparoscopic varicocelectomy at 3 months, 6 months, and at one year postoperatively. The semen mean volume increased from 2.91 ± 1.51 mL preoperative to 3.08 ± 1.22 mL, 3.08 ± 1.22 mL, and 3.25 ± 1.3 mL postoperative at three, six and twelve months respectively. The median density also changed from 26.1 to 31.4 m/mL, 36 m/mL and 37.9 m/mL postoperative at 3, 6, and 12 months respectively. The mean motility improved from $32.5 \pm 6.02\%$ to $39.3 \pm 7.4\%$, $42.6 \pm 8.01\%$ and $48.3 \pm 8.8\%$ postoperative at three, six and twelve months respectively. The median morphology also varied from 32.5% to 33.5 %, 34.5% and 35.5% postoperative at 3, 6, and 12 months respectively. The mean semen vitality varied from $57.7 \pm 15.1\%$ to $58.2 \pm 13.8\%$, $59.6 \pm 13.3\%$ and $62.5 \pm 15.3\%$ postoperative at 3, 6, and 12 months respectively.

Our research reported 40% and 32% in pregnancy rate at one year similar results reported by

A.M.Al-Kandari et al., [15] at one year was 30% and 40% in subinguinal and laparoscopic respectively in 120 patients in contrast Watanabe et al. [9] reported pregnancy rate increased at one year 40.4% for laparoscopic and 50.9% for subinguinal group.

5. Conclusion

Varicocele is a highly prevalent condition in the infertile male population. The best method in varicocele treatment is yet a contentious issue. Recently, although open varicocelectomy (subinguinal) dependable and preferred and most prominent technique, laparoscopic ligation of varicocele has still gaining in popularity too. Both methods has short hospital stay, rapid recovery and sooner return to work but laparoscopic has less postoperative pain, shorter

operative time and easy accessibility for bilateral varicocelectomy with better outcomes.

References

- [1] A.Emad, M.Elkaseer, E.Abbas. Results of laparoscopic varicocelectomy. *EJHM*, Vol.72(1), pp. 3823-3826,2019.
- [2] H.Elbardisi, W.Ansari, A.Majzoub . Deos varicocelectomy improve semen in men with azoospermia and clinically palpable varicocele?. *Andrologia*, Vol.52.pp.(2)13486,2020.
- [3] M.Caradonti. Effect of varicocelectomy of fertility. Indications, techniques and results. *Actas urol Esp*, Vol. 44(5), PP. 276-280,2020.
- [4] A.Farag, A.Aboelsaad, Y.Ahmed. laparoscopic varicocelectomy initial experience at Al-Azhar hospital. *Egyptian Journal of Hospital medicine*, vol.73(11) pp. 8077-8083,2018.
- [5] M.Abdelmageed , I.al-Azzawi. Comparative study between laparoscopic varicocelectomy and open varicocelectomy. *J Pak Med Assoc*, Vol. 69(suppl 3) .pp,(8): 73-77,2019.
- [6] V.Choudhary, R.Mathur , B.Sharma Comparative study laparoscopic varicocele ligation versus inguinal varicocelectomy. *International journal of mmmmedical science and education*, Vol.4(4), PP.323-327,2017.
- [7] y.Haluk, N.Penbegu .. M.Atar . Comparison of Laparoscopic and Microscopic Subinguinal Varicocelectomy in terms of Postoperative Scrotal Pain, Vol. *JSLs*, PP.16:212–217,2012.
- [8] R.Hasan, A.Dian, M.Azam . Comparison of the Efficacy of Laparoscopic Versus Open subinguinal Ligation for Varicocele, Vol.*J Urol*.175, PP.1076-9,2012.
- [9] A.Shamsa, L.Mohammadi, M.Abolbashari. Comparison of Open and Laparoscopic Varicocelectomies in Terms of Operative Time, Sperm Parameters, and Complications *Urol J*, Vol. 6 (3), PP.170-175,2009.
- [10] M.Watanabe, A.Nagai, N.Kusumi. Minimal invasiveness and effectivity of subinguinal microscopic varicocelectomy: a comparative study with retroperitoneal high and laparoscopic approaches *International Journal of Urology*, Vol.12(10), PP. 892–898,2005.
- [11] C.E.Iselin, U.Almagbaly, S,BorstF. Safety and efficiency of laparoscopic varicocelectomy in one hundred consecutive cases, Vol.58(4), PP.213-7,2007.

- [12] M.C.McManus, A.Barqawi, R.B.Meacham. Laparoscopic varicocele ligation: are there advantages compared with the microscopic sub inguinal approach? Urology, Vol. 64(2), PP.357-60,2004.
- [13] G.A.Bebars, A.Zaki, A.R.Dawood . Laparoscopic versus open high ligation of the testicular veins for the treatment of varicocele. JSLS, Vol.4, PP.209 –213,2000.
- [14] S.Islam, M.Islam, S.Sarkar . outcome of laparoscopic varico-celectomy with mass technique for symptomatic varicocele. Arch.Surg.Clin. Res, Vol.(3), PP. 65-69,2019.
- [15] A.M.Al-Kandari, H.Shabaan, H.M.Ibrahim. Comparison of outcomes of different varicocelectomy techniques: open inguinal, laparoscopic and sub inguinal microscopic varicocelectomy: a randomized clinical trial. Urology, Vol.69(3), PP.417-20,2007.